SPACEBORNE METEOROLOGICAL RADAR STUDIES

by

R. Meneghini (675)

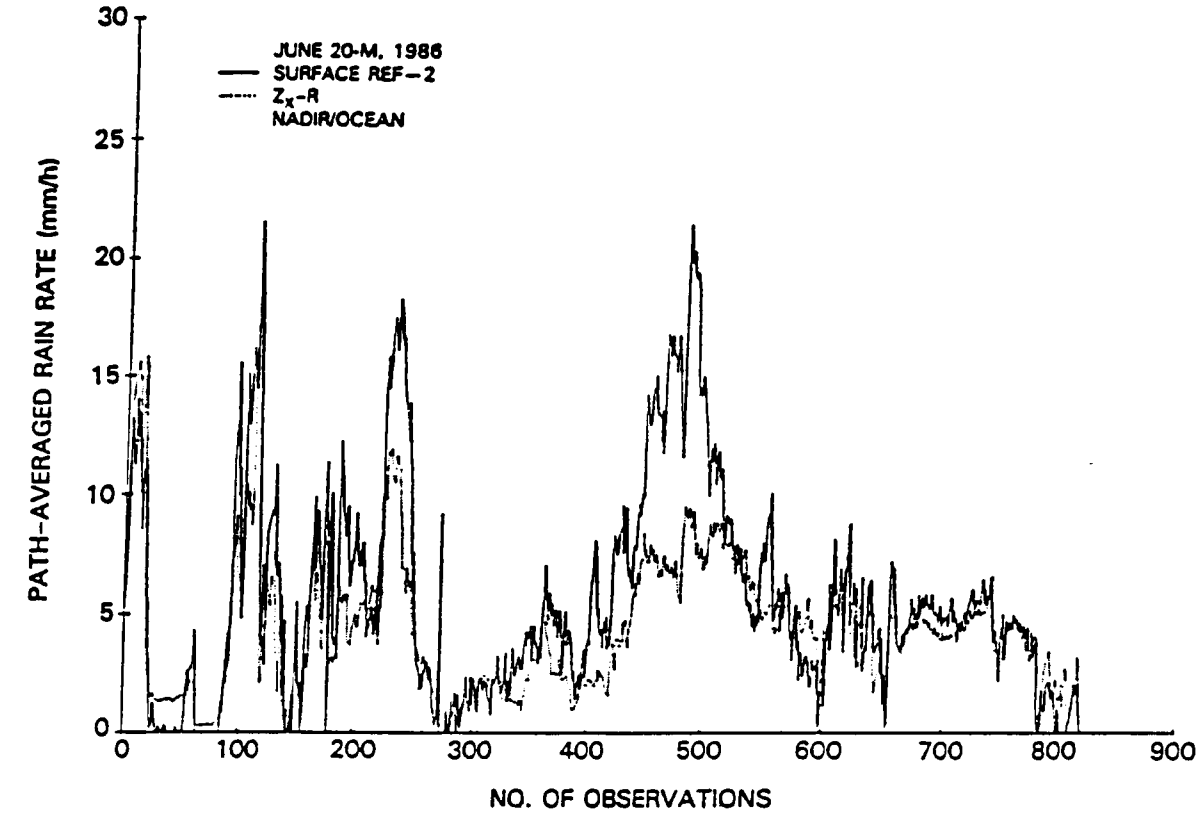
The objective of the work is to study various radar designs and methods for the estimation of rainfall parameters from space. An immediate goal is to support the development of the spaceborne radar that has been proposed for the Tropical Rain Measuring Mission (TRMM). The TRMM radar, which will be the first meteorological radar to be flown in space, has the unique capabilities for vertical profiling of the storm cell and for quantitative rainfall estimates over land. To take full advantage of the radar requires a detailed understanding of its performance and the manner in which these data can be combined with radiometric measurements.

The effort is divided into two activities: a cooperative airborne rain measuring experiment with the Radio Research Laboratory of Japan (RRL), and the modelling of spaceborne weather radars.

An airborne rain measuring experiment was conducted at Wallops Flight Facility in 1985-1986 using the dual-wavelength radar/radiometer developed by RRL. The data are presently being used to test a number of methods that are relevant to spaceborne weather radars. An example is shown in Fig. 1 of path-averaged rain rates as estimated from three methods: the standard

reflectivity rain rate method (Z-R), a dual-wavelength method, and a surface reference method. The results from the experiment have shown for the first time the feasibility of using attenuation methods from space. We can also begin to study how the various methods can be used to improve the accuracy and extend the dynamic range of rain rate estimation. A second phase of this experiment is planned for 1989. Toward this end, several upgrades of the instrument are being made for its installation in a high-altitude aircraft.

The purposes of the modelling are twofold: to understand in a quantitative manner the relationships between a particular radar design and its capability for estimating precipitation parameters; to help devise and test new methods. The models are being used to study the impact of various TRMM radar designs on the accuracy of rain rate estimation as well as to test the performance of range-profiling algorithms, the mirror-image method, and some recently devised graphical methods for the estimation of the drop size distribution.



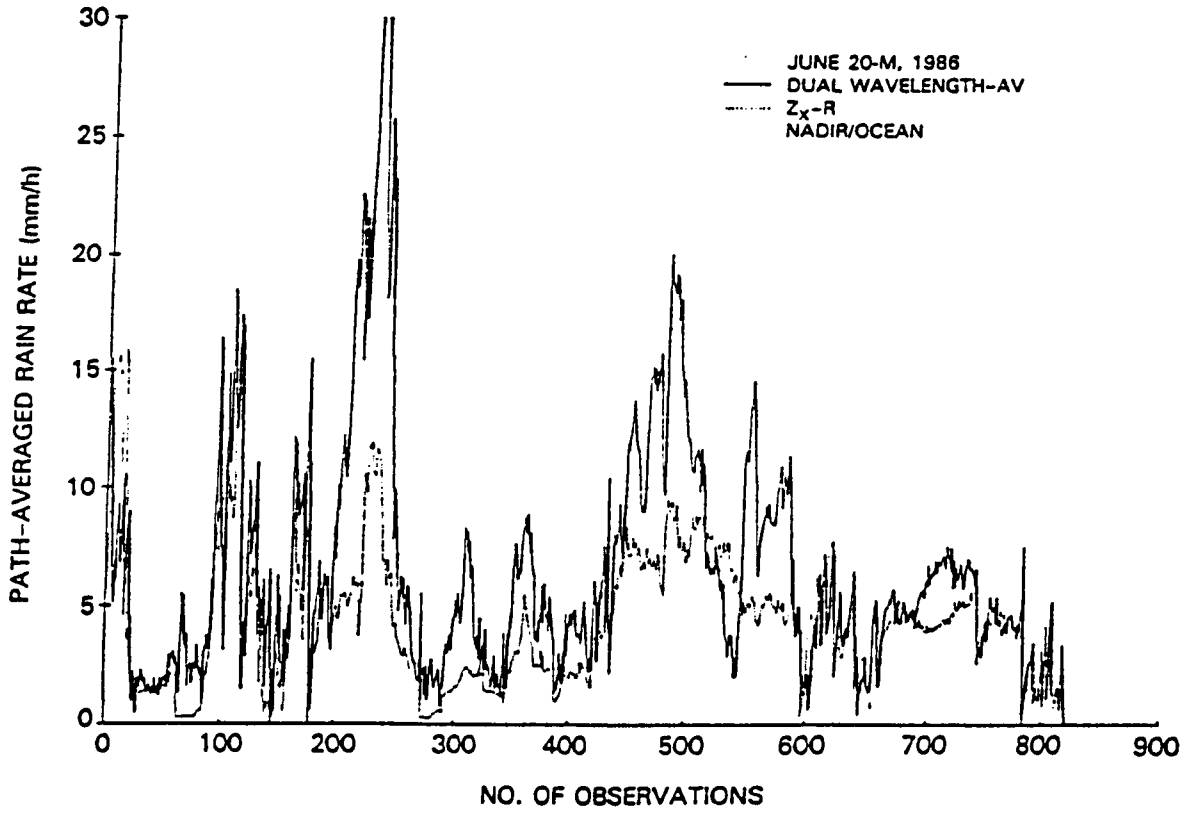


Figure 1. Path-Averaged Rain Rates